Los Alamos NATIONAL LABORATORY news release
A Department of Energy/University of California Laboratory
Communications and External Relations Division
Public Affairs Office
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02-___

SOIL'S LOVE AFFAIR WITH CARBON VIEWED WITH MILLIMETER RESOLUTION

WASHINGTON, D.C., May 29, 2002 -- Promoting the love affair between farmlands and carbon while substantially reducing harmful carbon dioxide in the atmosphere could be facilitated through super-sharp analysis of tiny soil-core samples made possible by a portable, carbon-measuring laser system developed by a research team at the Department of Energy's Los Alamos National Laboratory.

At the heart of the system is a technology called Laser-Induced Breakdown Spectroscopy – LIBS – that can make on-the-spot field measurements of carbon in soil with at least 95 percent accuracy. Unlike conventional carbon-measurement techniques that require bulky soil samples and weeks of analysis in distant laboratories to obtain results with the same or less accuracy, the LIBS system enables users to analyze a sample of soil from a 1-1/4 inch diameter core at millimeter resolution in about 15 minutes, researcher Michael Ebinger and his colleagues reported at the 2002 spring meeting of the American Geophysical Union underway in Washington, D.C., today.

The entire package of instrumentation can fit in the back of a van or light truck.

Ebinger says the system was designed to measure the amount of carbon in soils much more quickly and with greater accuracy than conventional methods. These carbon measurements, in turn, can be used to improve understanding of the role carbon plays in terrestrial agricultural and forest lands as well as its role in global warming. Even more immediate could be its use as a tool for helping agriculturalists get optimum productivity from their land and reducing the environmental impact of agriculture.

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Productive soils love a substantial amount of carbon along with other nutrients in order to be healthy, while improper tillage and crop-planting practices can actually release soil carbon into the atmosphere, where it joins carbon from other sources to contribute to the greenhouse effect," he reports. "But because the amount of carbon varies considerably from one type of soil to the next, measuring changes in land-based carbon in fields, rangelands and forests has been difficult, until the application of LIBS."

The benefits of knowing the exact soil composition of any particular piece of land could be multifold, Ebinger notes. For one, large tracts of arid land or once-productive farmland lacking in carbon could become "sinks," or banks, for the atmospheric carbon contributing to greenhouse gases. Second, increasing the amount of carbon in degraded soils can also lead to soil quality improvements, a substantial benefit to those living on poor-quality soils. Third, preventing the carbon loss that can result from soil mismanagement would help ensure that 'healthy' lands retain their vitality and value while minimizing adverse effects on the atmosphere.

Using farmland as a carbon "sink" is an emerging idea getting attention nationally and internationally, Ebinger says. The U.S. Department of Agriculture estimates that U.S. farm and grazing land soils are storing 20 million metric tons of carbon a year and could store an additional 180 million metric tons annually. And talk of trading carbon stored in land in exchange for emission "credits" occurs with increasing frequency in international treaty negotiations. Some private companies have even begun work on establishing a monetary value for traded stored-carbon credits.

Other Los Alamos researchers on the team include Clifton Meyer, David Cremers, Monty Ferris, David Breshears and Pat Unkefer. The work with LIBS is sponsored by DOE's National Energy Technology Laboratory (NETL) and the Office of Science; the USDA has supported development of the field-portable LIBS instrument; and the carbon project currently has collaborations for carbon measurements in soils with Ohio State University, Texas A&M University, The University of Southern Maine, and California State University and Polytechnic Institute (San Luis Obispo), and The Nature Conservancy.

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